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UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION VIII
999 18th STREET - SUITE 500
DENVER, COLORADO 80202-2466

1 of 25

Ref: 8EPR-FF

Mr. Steve Slaten
Department of Energy
Rocky Flats Office
P.O Box 928
Golden, CO 80402-0928

DEC 13 1995

re: OU 6 RI Report

Dear Mr. Slaten:

EPA has reviewed your September, 1995 Draft Final Phase II RFI/RI Report for OU 6. Specific comments prepared by our review contractor, which raise several issues of concern, are attached We have not included editorial comments. We have also attached comments on the risk assessment appendix submitted in August and included in the same version in this Draft Final. This includes comments forwarded to us by CDPHE.

In general, the report format is acceptable and follows the Guidance for Conducting Remedial Investigations and Feasibility Studies Under CERCLA (EPA 1988). Various minor problems were noted in the OU6 field investigation. These potential problems were primarily related to sample locations or the rationale used to select sample locations. Questions raised as to the adequacy of characterization of specific individual hazardous substance sites (IHSSs) are presented as specific comments.

In discussing the nature and extent of contamination and the potential for migration, the report does not adequately evaluate the role of the groundwater seeps located on the hillsides in several areas. CDPHE has raised several serious question about the way in which risk from these areas has been (or not been) calculated. EPA believes these seeps play an important role in the movement of contaminants from source areas to the drainages and ponds. This migration pathway has for the most part been ignored. It will require full evaluation if appropriate management decisions are to be made for remedial responses and protection of surface water.

Section 5.0 of the RI discusses the fate and transport of chemicals of concern (COCs) identified by the baseline risk assessment, but does not evaluate the movement of volatile organic compounds (VOCs) in the vicinity of IHSS 166.1, 166.2, and 166 3. Significant groundwater contamination by VOCs has been discovered in these areas The report states that contamination in the groundwater beneath these trenches will be handled under OU7. This is acceptable **only if** the OU7 remedy

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includes a full assessment and adequate response to these sources. We understand that the current plan for closure of OU7 does not incorporate these sources in the remedy design.

Our contractor reviewed the early submittals of the COC selection process and human health risk assessment (HHRA). The attached letter report presents their comments on these sections. In general, the COC selection process and HHRA methodology follow EPA guidance. However, some potential exposure pathways were not quantitatively evaluated, and several exposure parameters were inappropriately used to estimate chemical intakes. The potential exposure pathways should be quantitatively evaluated unless there is justification for exclusion from the quantitative analysis. Additionally, inappropriate exposure parameters should be removed from the intake algorithms due to insufficient information available to support their use and the potential for a significant underestimation of risk.

EPA comments must be addressed in preparing the final RI for submittal. CDPHE comments must be addressed to the satisfaction of EPA. If you have questions about these comments or would like to discuss how they should be resolved, please contact Bill Fraser (EPA) at 312-6580.

Sincerely,

W. C. Fraser (for)

Tim Rehder, EPA
Manager
Rocky Flats Project

cc. Joe Schieffelin, CDPHE
Tom Brown, GF

3.0 SPECIFIC COMMENTS

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The following comments describe specific technical inadequacies and inconsistencies noted by PRC in each section of the final RFI/RI report The comments reference a particular page and section number or table, figure, or appendix where appropriate.

1 Page 2-24, Second Paragraph This paragraph discusses soil boring installation and sampling in the Old Outfall Area The text states that samples were collected from the top of the prefill surface and from 2 to 24 inches below the prefill surface There is no explanation in this section, or in Section 3 9 5 2 (geology), of how the prefill surface was identified Soil borelogs in Appendix C-2 4 also do not clarify this distinction An explanation or description of how this prefill surface was identified should be included here or in Section 3 9 5 2

2 Page 2-33, Last Paragraph This paragraph presents the locations of soil borings in Trenches A, B, and C The text states that subsequent to drilling the eastern portion of Trench C, the IHSS location was revised and relocated south of the borings The reason for the change in the IHSS location is not stated If the IHSS boundary revision is due to aerial photograph interpretation, the results of the geophysical survey, or visible evidence (or lack thereof) in the soil borings, it should be stated in the text

3 Figure 2 2-19 This figure shows soil boring and monitoring well locations for IHSSs 166 1-3 The figure shows that no soil borings were placed in the revised location of the eastern portion of Trench C An explanation for this potential data gap should be provided in the text (Also see specific comment number 2)

4 Page 2-34, Third Paragraph, and Figure 2.2-19 The text states only one monitoring well (77392) was installed downgradient of Trench B This well has remained dry and has not been developed or sampled Analytical results of subsurface soil samples from Trench B contained elevated concentrations of VOCs, barium, calcium, americium, and uranium The text states that groundwater flow in this area is to the east and south toward North Walnut Creek Either due to dry conditions in this area or to inadequate well placement, groundwater quality downgradient of Trench B may not have been characterized This data gap should be addressed to determine whether contaminants detected in soil have migrated to groundwater

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5 Page 2-38, First Paragraph, and Figures 2.2-20 and 2.2-21 The text states that monitoring wells 77192 and 76792, located downgradient of the North Spray Field Area and South Spray Field Area, are dry Low concentrations of VOCs, metals, and radionuclides were detected in subsurface soil samples from both areas Since no groundwater samples were obtained, groundwater quality downgradient of these areas may not be adequately characterized In addition, two stream sediment samples and one surface water sample were omitted from the sampling program for the North Spray Field Area. Therefore, surface water and groundwater data gaps exists along the north branch of the unnamed tributary that flows east from the North Spray Field These data gaps should be addressed to evaluate the nature and extent of contamination in groundwater

6 Figure 2.2-14 This figure presents stream sediment, soil boring, and monitoring well locations at IHSS 143, the Old Outfall Area The figure shows the approximate boundary of IHSS 143 as extending north across the protected area (PA) fence All sample locations are located south of the PA fence If the outfall discharged to the north (downhill), the samples obtained from the locations shown may not have completely characterized potential contamination at this site This possible data gap should be explained in the text

7 Figure 3.9-1 and 3.9-2 Figure 3 9-2 presents a cross section of the Sludge Drying Beds and shows the thickness of alluvial material beneath the beds As shown on Figure 3 9-1, this 170-foot cross section is tied to only one soil boring (AB-3) Since the thickness of artificial fill shown on the cross section represents conditions in only one soil boring, it should be stated on Figure 3 9-2 that the thickness is primarily inferred In addition, Figure 3 9-2 shows two unlabeled, angle boreholes along the length of the cross section This does not agree with Figure 3 9-1 These figures should be corrected to more adequately present site conditions

8 Page 6-35 The text introduces some confusion by stating that the dose conversion factors provided in Table 6 7-3 are in terms of millirem per picoCurie (mrem/pCi) However, the values provided in this table are in terms of sieverts per becquerel To prevent confusion, the text should be revised to reflect this, or the table should be revised to be consistent with the text

9 Page 6-36 The text states that the total effective dose equivalent (TEDE) was calculated by summing the effective dose equivalent (EDE) and the committed effective dose equivalent (CEDE) The TEDE is merely the sum of the external exposures (deep dose equivalent) and internal exposures (CEDE) The CEDE is calculated using the EDE and assessing a 50 year exposure Therefore, summing both the EDE and CEDE will result in a redundant dose assessment These two factors should not be summed, and the TEDE should be calculated as described The text and calculations should be modified accordingly

10 Page I-3, First Paragraph In Appendix I, air modeling, the application of the Ventilated Valley Dispersion Model (VVDM) is discussed for estimating airborne concentrations of particulate matter The discussion is confusing regarding some of the assumptions made The text states, "For this study, no upwind boxes are assumed, therefore, no dilution of ambient concentrations from fresh air entering the box is assumed This is a highly conservative assumption 'Dilution' occurs only as a result of wind flushing the box " It is unclear from the discussion how it is conservative to assume no upwind boxes Furthermore, it is not clear how no air can enter the box on the upwind side, yet air flushes out the downwind side of the box The discussion should be expanded to address the reasons why the chosen approach is conservative, and how conservation of mass is maintained

11 Page I-3, Second Paragraph Regarding the application of the VVDM for estimating airborne particulate concentrations, the second sentence says, "In this case, sequential time steps of 10 seconds are assumed Concentration estimates are made for as many as 360 model time steps every hour " The paragraph should be modified to explain why 10 second time steps are assumed

12 Page I-8, Fourth Paragraph Regarding the application of the VVDM for estimating airborne particulate concentrations, the second sentence states, "Then the model was executed only for the total number of hours that exceeded a threshold wind speed of 18 62 meters per second (m/s) " It appears that this technique was used for both VVDM modeling scenarios the wind erosion scenario and the construction activity scenario Although a threshold wind speed is appropriate for the wind erosion scenario, it is not appropriate for the construction scenario Particulate emissions from construction occur regardless of whether strong winds are present Wind speed is not a variable in the construction activity emission factor that was

used The VVDM modeling should be modified so that the construction activity scenario includes all meteorological time periods

4.0 SUMMARY

The OU6 RFI/RI report has adequately characterized the contamination present in the 21 IHSSs that comprise OU6 The background discussions of the OU are clear and concise. The discussion of the field investigation is, for the most part, very well written and accurately portrays the work done for the investigation The physical characteristics of the site are clearly presented. The nature and extent of contamination is well presented through the use of tables and figures to accompany the text The fate and transport of contaminants has been adequately described.

The only point of concern within the first 5 sections of the report is limited discussion of the VOC plume discovered along the south margin of the OU7 landfill Discussion of this contamination has been deferred to the OU7 report Due to the separation of tasks at RFETS, this may pose a problem if the contractor preparing the OU7 report is unaware of this commitment

Some questions remain about the risk assessment These were addressed in a separate letter report to EPA (PRC 1995), but have not yet been addressed by DOE in this report These issues must be resolved before the RFI/RI can be finalized

5.0 REFERENCES

PRC Environmental Management, Inc (PRC) 1995 Technical Review of the Draft Final Phase I RFI/RI Report, Operable (OU6), Rocky Flats Environmental Technology Site (RFETS) September 26

U S Environmental Protection Agency (EPA) 1988 Guidance for Conducting Remedial Investigations and Feasibility Studies Under CERCLA EPA/540/6-89/004 October

EPA 1989 Risk Assessment Guidance for Superfund, Volume I Human Health Evaluation Manual (Part A), Interim Final EPA/540/1-89/002 Office of Emergency and Remedial Response December

EPA 1994 Rocky Flats Plant, Final Human Health Risk Assessment Template 1994

PRC Environmental Management Inc
1099 18th Street
Suite 1960
Denver CO 80202
303-295-1101
Fax 303 295-2818

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PRC

September 26, 1995

Mr Bill Fraser
U S Environmental Protection Agency, Region 8
999 18th Street
Denver, Colorado 80202

**Subject: Technical Review of the Draft Final Phase II RFI/RI Report
Operable Unit (OU) 6, Rocky Flats Environmental Technology Site (RFETS)
Contract 68-W9-0009, Work Assignment C08055**

Dear Mr Fraser

At your request, PRC Environmental Management, Inc (PRC) reviewed the draft chemical of concern (COC) selection process and the human health risk assessment (HHRA) submitted to EPA by the Department of Energy in September 1995 These documents are part of the Draft Final Phase II Resource Conservation and Recovery Act (RCRA) facility investigation (RFI) and Remedial Investigation (RI) report for operable unit 6 (OU6) This letter presents comments on the COC selection process and HHRA It was assumed that data summarized and used to select COCs and conduct the HHRA were acceptable, data will be reviewed when the OU6 RI report is submitted

In general, the COC selection process and HHRA methodology follow EPA guidance (1989, 1994) However, potential exposure pathways were not quantitatively evaluated, and several exposure parameters were inappropriately used to estimate chemical intakes In addition, the radiation dose assessment appears to be incomplete and will be further evaluated in the future by a health physicist Overall, the risk assessment methodology was similar to that presented in the OU2 RI and has the same problems

COC Selection

The COC selection process generally follows the COC selection methodology outlined in the Rocky Flats Plant Final Human health risk assessment template (EPA 1994) They were eliminated based on professional judgement (such as spatial and temporal distributions, geochemical characteristics, and presence of high total suspended or dissolved solids in ground water) Several chemicals were eliminated as COCs even though their concentrations significantly differed from background concentrations However, if it is determined by statistical analyses that site chemical concentrations differ significantly from background concentrations, they should be retained as COCs Professional judgement should only be applied when deciding whether to include, not exclude, chemicals as COCs Chemicals that are significantly different from background should not be eliminated as COCs based on professional judgement

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Additionally, calcium, iron, magnesium, potassium, and sodium were eliminated as COCs because they are considered essential nutrients, occur naturally in the environment, and are toxic only at very high doses Before chemicals are eliminated based on essential nutrient status, chemical concentrations should be compared to recommended daily allowances (RDAs) or safe and adequate daily dietary intakes (SADDIs) (EPA 1994) If comparisons reveal that essential nutrients do not pose a health hazard, they can be safely eliminated from the HHRA It is not likely that any of the essential nutrients will be included as COCs but the comparison is necessary

HHRA

Several potentially complete exposure pathways were not evaluated in the HHRA It is noted that "a potentially complete pathway was not assessed when, based on professional judgement and logic, the contribution of the pathway to overall exposure is likely to be orders of magnitude lower than exposure from other pathways, and the pathway is not expected to contribute significantly to overall risk to the receptor " However, it is premature to determine the relative significance of each exposure pathway before risks are quantified Furthermore, EPA guidance (1989) states that all complete pathways should be evaluated unless there is justification to eliminate a pathway from quantitative analysis The additional exposure pathways that need to be quantitatively evaluated in the HHRA include inhalation of volatiles and internal exposure to radionuclides for all receptors, and exposure to surface soil for construction workers

Several exposure parameters in the intake algorithms should not be used because there is insufficient information to support their use Additionally, they could result in a significant underestimation of the risk Exposure parameters that should not be used include fraction contaminated (FC), matrix effect (ME), and particulate deposition factor in lungs (DF)

The FC exposure factor represents the contact rate However, adjustments in exposure frequency, duration, and intake rate parameters account for exposures that occur less than 100 percent of the exposure time Use of the FC parameter can greatly underestimate risk Additionally, adjustments should be made based on site-specific information about the receptor and receptor behavioral patterns

The ME factor was used to account for decreased dermal absorption and bioavailability of specific chemicals However, prior to using any ME factors, soil type on which the ME is based should be compared to site-specific conditions If soil types are dissimilar, then the ME cannot be used to estimate the various intakes Previously, EPA requested that ME factors be submitted for approval prior to use in the risk assessment Until there is EPA concurrence, the ME factor should not be used in the exposure equation and no adjustments should be made for bioavailability

The DF parameter was used to estimate the amount of inhaled particulate that is deposited in the lungs In general, a DF may be used to represent the amount of respirable contaminated particulate matter (PM_{10}) that is present in the air, but should not be used to decrease the exposure concentration if the concentrations in air already represent the PM_{10} fraction Furthermore, if it is assumed that only a percentage of the particulates will deposit in the lungs, the remaining percentage will either be swallowed or expectorated Therefore, the ingestion equation should be revised to account for the

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portion of inhaled particulates that is swallowed However, it would be more appropriate to eliminate the factor from the reasonable maximum exposure (RME) inhalation equation for all receptors, as was stated by EPA in the April 11, 1995 letter and in previous discussions between EPA and DOE

If you have any questions or comments concerning this review, please call me at (303) 312-8811

Sincerely,

Kathy J Chaloupka
Senior Toxicologist

KJC/mlr

References

U S Environmental Protection Agency (EPA) 1994 Rocky Flats Plant, Final Human Health Risk Assessment Template 1994

EPA 1989 Risk Assessment Guidance for Superfund, Volume I Human Health Evaluation Manual (Part A), Interim Final EPA/540/1-89/002 Office of Emergency and Remedial Response December

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Colorado Department of Health

Hazardous Materials & Waste Management Division

Comments

on

DRAFT FINAL

Phase I RFI/RI Report

Appendix J

Baseline Health Risk Assessment

WALNUT CREEK PRIORITY DRAINAGE

OPERABLE UNIT NO. 6

ROCKY FLATS ENVIRONMENTAL TECHNOLOGY SITE

AUGUST, 1995

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Specific Comments:

1) Vol.I. Appendix J. Page ES-2.

Are there any seeps on Walnut Creek within OU6, and if so, is human exposure, either to ecological workers or open space receptors possible at these sites?

2) Vol.I. Appendix J. Page ES-3.

DOE must ensure that the Old Outfall (IHSS 143) actually is included in the OU8 (Industrial Area) evaluation.

3) Vol.I. Appendix J. Page ES-3.

Why was surface water modeling done instead of actual measurements? Were modeled numbers ever verified by comparison with the actual site measurements? (see comment 38)

4) Vol.I. Appendix J. Page ES-4.

As in the OU2 RFI/RI, DOE again seems to be inappropriately "stretching" the 10^{-4}-10^{-6} risk range, especially when determining the point of departure. The risks and uncertainties associated with exposure from contaminants should be stated in an RFI/RI

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without any attempts at editorializing. Risk at 10^{-6} is still the point of departure.

5) Vol.I. Appendix J. Section J1.4 IHSSs Evaluated in the HHRA.

DOE must ensure that the groundwater collected under the South Spray Field Area (former IHSS 167.3) and at Trenches A,B, and C (IHSS 166) are evaluated under the OU7 and OU8 (Industrial Area) RFI/RIs.

6) Vol.I. Appendix J. Section J2.1.1
Data Sets Used in the Risk Assessment. Surface Soil Section.

The section describing surface soil samples collected and used is confusing. DOE should make it clear (since this is a public document) that surface soil samples were collected from all possible sources in OU6, but that some areas were eliminated by the CDPHE Conservative Screen as low risk, and were not included in the baseline human health risk assessment.

7) Vol.I. Appendix J. Section J2.1.1 Data Sets Used in the Risk Assessment. Subsurface Soil Section.

This information may be more clearly presented in other volumes of the RFI/RI, but was not clear in the Human Health Risk Assessment volumes. What were the exact subsoil sampling locations? IHSSs 166.3 (Trench C East) and IHSS 167.3 (South Spray Field east) had significant changes in boundary definition, apparently (from the text on page J2-2) <u>after</u> samples used in the HHRA were taken. Therefore, it was really unclear whether the correct locations for Trench C East (IHSS 166.3) and for the South Spray Field Area (IHSS 167.3) were re-sampled, and if so, whether this information was included in this risk assessment. Do the values that were used either in the CDPHE screen or in this HHRA reflect the actual concentrations found at those newly defined IHSSs or at the relatively uncontaminated sites that had been misidentified as IHSSs?

8) Vol.I. Appendix J. Section J3.1.3 Frequency of Detection

Editorial comment: First sentence is not clear. Add, "and also all" prior to "detected organic compounds".

9) A) Vol.I. Appendix J. Section J3.1.4 Professional Judgement.

CDPHE comments to EPA on Sept. 27, 1994 for OU-6, TM-4 (COCs), questioned DOE's rationale for eliminating cesium-137 as a COC in groundwater because the most recent data showed an upward trend. DOE should address or reiterate any prior response to the following comment:

"**<u>Section 5.4:</u>** (partial) ... The last two samples from

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both wells with cesium-137 detects, however, showed the highest concentrations. Are there any more recent samples from these two wells that show that cesium-137 is not still increasing, perhaps indicating a contaminated plume?"

B) Vol.I. Appendix J. Section J3.1.4 Professional Judgement.

CDPHE comments to EPA on Sept. 27, 1994 for OU-6, TM-4 (COCs), questioned DOE's decision to eliminate all metals as COCs in groundwater due to elevated suspended solids. The decision was questioned on the grounds that most people do not drink filtered well water, and that the risk from drinking unfiltered water therefore should be assessed for all metals per RAGS guidance. DOE apparently ignored these comments too, except for assessing groundwater arsenic, antimony, beryllium and manganese in separate risk evaluations as "background" components. Because these metals are among those that could pose the greatest risk from drinking unfiltered water, these separate risk evaluations are an adequate way for DOE to address my concern.

10) Vol.I. Appendix J. Section J3.3.1 Page J3-6 Concentration/Toxicity Screens, and Table J3-10.

The concentration-toxicity screen DOE performed on radionuclides in subsurface soil should have used external radiation slope factors for a construction worker's exposure to uranium-238 and uranium-235 rather than the inhalation or oral slope factors, since the external radiation factors are larger (RAGS p. 5-24). When these slope factors are substituted, both U-238 and U-235 are responsible for more of the total risk than Pu or Am. Pu-239/240 and Am-241 contribute less than 1% of the total risk. Nevertheless, for the reasons delineated in the text on Page J3-6, Pu-239/240 and Am-241 should remain as COCs for subsurface soil. So, the text is correct, but the table is wrong, and should be corrected.

11) Vol.I. Appendix J. Section J3.1.6 Page J3-3. Evaluation of Infrequently Detected Compounds.

CDPHE still contends that it is not appropriate to use RBCs calculated for any other receptor except residential (i.e., the most conservative) when trying to eliminate chemicals as COCs. Therefore, residential PRGs as opposed to construction worker PRGs should have been used to compare with concentrations of infrequently detected compounds. The screening process for COCs should be inclusive and conservative.

12) Vol.I. Appendix J. section J3.3.1 Page J3-7 Concentration/Toxicity Screens.

Despite DOE's inappropriate use of construction worker PRGs instead of residential PRGs, it did not appear to make any difference in

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the final list of COCs for subsoil. 13

13) Vol.I. Appendix J. Section J3.4.1 Concentration/Toxicity Screens Groundwater. Page J3-9.

DOE's rationale to eliminate both strontium-89/90 and radium-226 because of small sample sizes is based on poor logic. Instead, it is more appropriate to be conservative, since sample sizes are so small, and keep these two chemicals as COCs. Small sample size is not a good reason to eliminate strontium. However, the fact that strontium detects occurred apparently sporadically, and there did not appear to be an upward trend in the most recent samples, is a good reason to eliminate this chemical. The text should be revised.

DOE included radium as a COC, but devoted several paragraphs to why it should not be considered as one, citing small sample size, and similarity to background as reasons. However, Table J3-15 shows 1.2 pCi/liter radium in groundwater, a level "close to background", contributed 13.5% of the total risk. Moreover, "radium was only analyzed for in two other samples outside IHSS 143" (the Old Outfall, which will be evaluated in another RFI/RI). Thus, DOE does not have much data on which to base its conclusion that radium should be eliminated. It is inappropriate to eliminate a chemical as a COC based on limited sample size. Rather, the conservative, public health protective approach should be used when data is limited, and, because of the relatively large contribution to the total risk and the small number of samples, the text discussing why radium should be eliminated as a COC should be deleted. Finally, another argument for including radium in the background data set is that radium was not analyzed for in background groundwater. It also was not analyzed for in surface soil. Therefore, no information is available as to whether it could have come from sources at OU6. Therefore, because of the lack of radium data for a proper comparison, the whole section arguing for elimination of radium as a COC should be eliminated.

When checking the risk calculation tables in Vol.II, DOE did NOT include inhalation of radium originally from groundwater in its risk calculations. Therefore, DOE appears to have eliminated this COC after all, and underestimated the risk.

14) Vol.I. Appendix J. Section J3.4.2 Groundwater COCs Evaluated in the HHRA. Page J3-10.

CDPHE internal advisory comment, removed.

15) Vol.I. Appendix J. Section J3.5.1 Concentration/Toxicity Screens Pond Sediment. Page J3-11.

Are there any seeps in OU6 whereby groundwater contaminants could contact pond sediment?

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16) Vol.I. Appendix J. Section J3.5.3 1994 Pond Sediment Samples. Page J3-12. Also Vol. II. Attachment J5.

I do not understand why DOE did not include PAHs and metals as well as rads and Aroclor-1254 in the 1994 assessment of pond sediment. The fact that PAHs and metals were not also included in the 1994 risk assessment of pond sediment, means that the final risk values from the 1994 risk assessment and the 1992 risk assessment cannot be strictly compared. Another factor that differs between the two is two foot composite samples were taken in 1992, while only 6 inch samples were taken in 1994. Therefore, 1992 surface sediment contaminants (which are the most likely that ecoworker or open space receptors may be exposed to) may have been diluted more with deeper sediments in the 1992 samples. This is borne out by the higher concentrations and risks found in the 1994 assessment compared to the 1992 assessment.

17) Vol I Appendix J. Section J3.6 Pond Surface Water COCs. Page J3-12.

Were only metals and rads, not VOCs, SVOCs, and WQPLS sampled for in both filtered and unfiltered water samples? That's what the text implies.

18) Vol.I. Appendix J. Section J3.7 Stream/Dry Sediment COCs. Page J3-13.

DOE did not include all pond sediment COCs in its assessment of dry sediments. Instead, it only assessed risk from those COCs that were found in stream sediments. Therefore, PCBs, antimony, silver, and bis-2-(ethylhexyl)phthalate, which are all found in pond sediments, but not stream sediments, are not assessed in the risk assessment for dry sediments, even though DOE states, "Dry sediment is exposed sediment near stream channels or <u>in the floodplains of the ponds".</u> The risks from ingestion, dermal exposure and inhalation of dust containing these pond sediment chemicals should be included in DOE's assessment of dry sediments, at least qualitatively. Otherwise, DOE has underestimated the risks from this media.

What DOE did instead of assessing all appropriate COCs that could be in dried sediment from streams or pond edges was to use the stream sediment COCs in the risk assessment, and compare them to COCs present in "dry sediment" (obtained from which source?). Since there were few differences in the concentrations of chemicals or metals between the two groups, DOE decided that "dry sediment would have little or no effect on the selection of COCs (Table J3-29)" It is CDPHE's observation that DOE chose to use the most convoluted way possible, instead of using the simple approach, which would have been to just use all stream and pond COCs.

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19) Vol.I. Appendix J. Section J3.7.3 Chemicals of Interest (COIs)

In the OU3 dispute resolution last spring, both Agencies had asked that beryllium be included with arsenic as a chemical of interest, since it had been used at the plant, and was indistinguishable from background. I understood this request was to be applied to all OUs not merely OU3 (OU3 meeting notes from February 3, February 8, April 25, 1995).

20) Vol.I. Appendix J. Table J3-3. Metals and Pesticides/PCBs Detected at less than 5% Frequency, Surface Soil.

None of the maximum detected concentrations of these chemicals exceeded the residential soil PRGs.

21) Vol.I. Appendix J.

Where is the frequency of radionuclide occurrence table for surface soils, similar to Table J3-2 and J3-3?

22) Vol.I Appendix J. Section J3.5.1 Concentration/Toxicity Screens Pond Sediment COCs. Page J3-10 and J3-11.

This comment relates back to comment No. 1. DOE eliminated manganese from further evaluation as a COC in pond sediment on the basis that it was not a potential contaminant in surface soil, subsurface soil, or groundwater. However, Mn <u>was</u> identified as a COI (contaminant of interest) in groundwater. Is there anyplace in OU6 where groundwater "daylights", perhaps at a seep, and becomes surface water? The volumes I reviewed made no mention of seeps on OU6 Are there any there, and if there are, could the high Mn in groundwater, which DOE says is indistinguishable from the high background, come to the surface and become a problem in pond or stream sediment?

23) Vol.I. Appendix J. Table J3-7 Organic Compounds and Metals Detected at less than 5% Frequency Subsurface Soil.

None of the maximum detected concentrations exceed residential soil PRGs. Therefore, this table is OK, despite DOE's use of construction worker RBCs, instead of residential RBCs, which CDPHE had requested.

24) Vol.I. Appendix J. Table J3-9. Concentration/Toxicity Screen Subsurface Soil, Carcinogens.

Minor comment· The risk factor listed in this table for bis(2-ethylhexyl)phthalate is incorrect. The correct value should be 1.54 E-3. However, substitution of this small number makes no difference in the final summed total risk factor.

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25) Vol.I. Appendix J. Table J3-12. Organic Compounds and Total Metals Detected at Less than 5% Frequency, Groundwater.

The following maximum detected concentrations exceed the residential PRGs for groundwater ingestion and indoor use: 1,1-DCE, benzene, carbon tetrachloride, and vinyl chloride. DOE eliminated these chemicals based on frequency of occurrence and because the groundwater is not likely to be used by onsite residents in the future. However, if the groundwater were ever used, these concentrations would pose a risk. In addition, these chemicals could also migrate from groundwater into any basements on site, and pose a risk by inhalation.

26) Vol.I. Appendix J. Table J3-13. Concentration/Toxicity Screen, Groundwater, Noncarcinogens. Also Page J3-10.

DOE did not perform this concentration/toxicity screen for groundwater noncarcinogens appropriately. DOE included nitrate in the toxicity screen, and showed that it was responsible for 98.9% of the risk. Then DOE used professional judgement <u>after</u> the concentration/toxicity screen to eliminate nitrates from the risk evaluation. In doing this, DOE disregarded the agreement made between the three parties this past spring that professional judgement to eliminate chemicals from the risk assessment would only be used as part of the spatial/temporal/geochemical step of the Gilbert statistical analysis, and would <u>not</u> be used after the concentration/toxicity screen. If DOE had eliminated nitrate early on during the process on the basis of professional judgement, a number of the other groundwater contaminants, all VOCs, which could pose some risk by pathways (i.e., inhalation) other than ingestion, would not have been eliminated as COCs. Inhalation is a complete pathway for anyone (i.e., an office worker) who spends time in a building with a basement. As it is, DOE showed a significant proportion of risk could come from nitrate in groundwater that was ingested, and then essentially discounted it since a) groundwater ingestion would not be a complete pathway under the agreed upon exposure scenarios, and b) the source term information is OU4 data, not OU6 data. Then, DOE essentially ignored any contribution to risk from the VOCs in groundwater (since they had not passed the con/tox screen). This is a public document, and such practices certainly do not add to DOE's credibility as an objective reviewer of the contamination data at Rocky Flats.

27) Vol.I. Appendix J. Table J3-17 Organic Compounds and Metals Detected at Less than 5% Frequency, Pond Sediment.

The following maximum detected concentrations exceed the residential surface soil PRGs, even though these chemicals occur at a low frequency: Aldrin and Aroclor-1260. Neither of these chemical maximum concentrations exceed open space PRGs for surface soil.

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28) Vol.I. Appendix J. Table J3-18 Concentration/Toxicity Screen, Pond Sediment, Noncarcinogens. Also Tables J3-19 and J3-20.

This comment relates back to comment no. 18. DOE should have considered the possibility that pond sediments, especially those around the pond edges could dry up and become available for inhalation. Therefore, as mentioned in comment 18, DOE should have considered inhalation as a complete pathway for all chemicals detected in pond sediments when performing the concentration/ toxicity screen. The footnote at the bottom of each table stating "inhalation is an incomplete pathway" should be deleted. If inhalation RfDs or slope factors are available, and would result in a more conservative risk factor than the oral toxicity numbers, they should be used when performing the concentration/toxicity screen.

29) Vol.I. Appendix J. Table J3-22 Organic Compounds and Total Metals Detected at Less than 5% Frequency, Pond Surface Water.

None of the maximum detected concentrations exceed the PRGs for residential swimming.

30) Vol.I. Appendix J. Section J4.1 Current and Future Land Use, Page J4-3, Future Offsite Land Use.

DOE should mention that "mixed" land uses include residential.

31) Vol.I. Appendix J. Section J4.1. Page J4-3 & 4, Future Offsite Land Use.

The fact that DOE chose not to consider current and future offsite receptors when evaluating individual OUs like OU6 means that a site-wide Baseline Risk Assessment which does consider the impact of the RFETS site to offsite receptors is now necessary.
This "hole" in the individual OU risk assessments should not be forgotten.

32) Vol.I. Appendix J. Section J4.4.1 Site-wide Exposure Pathways that are Incomplete or Potentially Complete, but not Assessed. Page J4-7.

Ingestion of fish may be a potentially complete pathway if stream flows are substantially increased as projected in the Vision document. If any changes in use are brought about by the Vision or other site-wide actions, this risk assessment will have to be re-visited to include pathways that were considered incomplete before. Otherwise, DOE will underestimate potential exposures.

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33) Vol.I. Appendix J. Section J4.4.4 Future Construction Workers. Page J4-9 & 10.

Exposure by construction workers to surface soil is a complete, and substantially significant pathway. CDPHE has repeatedly asked DOE to include this pathway in its analysis of this receptor's exposures, but DOE has consistently failed to do so. As such, DOE has underestimated the risks to this receptor. This must be kept in mind when using DOE's PRG values for the construction worker as well as when reviewing DOE's risk evaluations. In addition, DOE also refuses to evaluate potential construction worker exposure to surface water and sediments. This approach also underestimates risks since road, bridge, and culvert construction all could involve exposure to these two media.

34) Vol.I. Appendix J. Section J5.1 Calculating the RME Concentration.

EPA guidance (RAGS, p 5-10) is that diluted samples which far exceed the measured concentrations of the chemical in other samples should be reanalyzed first to confirm the result, before the step is automatically taken to excluded them from the data set if they cause the arithmetic mean concentration to exceed the maximum detected concentration.

35) Vol.I. Appendix J. Section J5.4 Groundwater. Page J5-3.

The only pathway evaluated for groundwater was volatilization of chemicals from groundwater to basement indoor air.

36) Vol.I. Appendix J. Section J5.8 Outdoor Air (Particulate-Associated COCs). Page J5-4.

DOE states on this page that, "airborne emissions of SVOCs, metals, and radionuclides associated with wind erosion of particulate matter (dust) less than 10 microns in diameter (PM10) were evaluated". However, when one checks the risk calculations in Vol II for all the receptors, those COCs which do not have inhalation toxicity factors, including metals and the SVOCs, were not quantitatively evaluated for exposure to this pathway in the risk assessment, even though they were modeled, and exposure point concentrations (annual averages) were determined (Table J5-11). In addition, these chemicals were not evaluated qualitatively in the uncertainty section either Therefore, DOE has underestimated the risks from the inhalation pathway. The State has repeatedly asked for at least a qualitative assessment of the inhalation risks from those chemicals that do not have inhalation toxicity numbers, and DOE has consistently refused to do this important evaluation.

37) Vol.I. Appendix J. Section J5.8. Outdoor Air (Particulate-Associated COCs). Page J5-4 to 6, and Section J5.9 Indoor Air (VOCs).

Someone should look in more detail at the air model used to model wind erosion, as well as the other air models used to estimate construction activity dust and indoor air concentrations. What assumptions were made for these models? Were they appropriate? How do the results of these models compare to measured values taken at the site? Are these models the same ones which were approved for use in OU2?

38) Vol.I. Appendix J. Section J5.10 Surface Water and Sediment Modeling Results. Page J5-7.

DOE decided to model exposure point concentrations for pond sediment rather than use actual measured concentrations, even though these were available from both 1992 and 1994. One of the assumptions included in the model was that the RME concentration in sediment would be estimated at one-half the total deposition time of 30 years = 15 years, so that the sediment concentration would represent a depth-weighted average. I do not know if this is an appropriate assumption, given the rate of sedimentation in the A and B series ponds. Elizabeth Pottorff or Sandy Marek of CDPHE's WQCD should be consulted concerning the validity of the assumptions made or the results of the model.

Moreover, when the RME concentration of Am-241, and Pu-239 were modeled at 15 years, the value for Pu used in the risk assessment was about 5 times lower than the actual measured values from the 1994 study, which were also used as RME point estimates in a separate risk assessment (Table J5-13 & Appendix J5, Table 2) (7.83 E+1 was the maximum for all 4 B series ponds in the modeled 1992 data vs a 95% UCL on the mean of 403.3 pCi/g for Ponds B1 and B2 in the measured 1994 data). This seems like a big difference to me between modeled and measured values I am not sure the modeled value used as the RME concentration in the Baseline Risk Assessment was the most appropriate number to use, especially since this RME exposure point concentration was not calculated according to EPA guidance (Supplemental Guidance to RAGS: Calculating the Concentration Term, EPA, 1992).

In addition, all pond sediment COCs were only evaluated for risks from sediment ingestion Aroclor 1254 and bis(2-ethylhexyl)phthalate were the only pond sediment COCs evaluated for risks from dermal exposure. The external radiation and inhalation pathways were not assessed for any of the pond sediment COCs (unless there was overlap with stream sediment COCs). Therefore, as stated in comment No 18, risks from inhalation of PCBs, antimony, silver, bis-2(ethylhexyl)phthalate, as well as vanadium, and the PAHs in pond sediment were not evaluated.

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Moreover, the RME concentrations of americium and of plutonium in pond sediments (9.28 and 28 pCi/g respectively in the A pond series and 99.3 and 78.3 pCi/g respectively in the B pond series) were several times higher than the RME concentrations in stream/dry sediments (0.3107 and 2.519 pCi/g for Am and for Pu, respectively). DOE used the lower concentrations to estimate risks from inhalation of sediments. Therefore, DOE again underestimated the risks from this exposure pathway for all appropriate receptors. This comment also applies to the external radiation pathway.

39) Vol.I. Appendix J. Section J6.2.1 Soil and Sediment Ingestion. Page J6-3.

Neither EPA nor CDPHE have approved the use of the soil or sediment matrix effect (ME). DOE proposed to use a soil matrix effect of 0.5 or 1, depending upon the specific chemical, on OU5 and OU2, and was refused both times. Now it has appeared again in the OU6 risk assessment. The Agencies expect DOE risk assessors on separate OUs to communicate, and not repeat the same errors for OU6, OU4, etc. where the points were not discussed directly. The answer is still "no", it is not appropriate to use a single soil matrix effect across the board, without including site-specific information, as delineated in several memos from EPA's Susan Griffin. This exposure factor should be deleted from all text and tables, and the risk calculations which had used it should be revised. In at least one case, the deletion of this factor and recalculation of risks results in an increase of risks over the 1 E-6 point of departure number. This is true for: Open Space Recreational Use AOC No. 4, RME time-weighted average pond sediment ingestion (for Aroclor-1254). It is also true for the total RME risks for the open space receptor in the 1994 sediment risk assessment for the B series ponds (Attachment J5). The total risks from all pathways for this receptor = 8.97 E-6 if the Matrix Effect is deleted. Recalculation of HQs after deletion of this factor did not seem to have any major effect since most HQs were much below 1.

40) Vol I. Appendix J. Section J6.2.2 Inhalation of Airborne Particulate Matter and of Indoor VOCs Page J6-7.

Neither EPA nor CDPHE agree with the simultaneous use of the DF, particulate deposition factor in lungs (0.85) and a Rocky Flats site-specific central tendency or RME respirable fraction (PM10), like DOE proposed to use in the Template. In this OU6 risk assessment, DOE has dropped the site-specific respirable fraction, the factor which was more acceptable, and kept the DF because air modeling was performed using only the PM10 fraction. Therefore, the respirable fraction factor was not used in the risk calculations. A major problem with the 0.85 respiratory deposition factor is that without chemical-specific pharmacokinetic data, it is toxicologically unsound to assume that less than 100% of the small (< 10 um) particulates deposited in the upper respiratory tract are not available to cause local tissue damage or systemic

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effects after absorbtion through the upper respiratory passages or after being coughed up and swallowed. Both CDPHE and EPA toxicologists believe that this deposition fraction should be removed. All inhalation pathway equations that used the DF should be revised, and the calculations corrected.

41) Vol.I. Appendix J. Section J6.2.3 Soil and Sediment Dermal Contact. Page J6-7 & 8; Vol.II. Attachment J3, Open Space Recreational Use AOC 3 and 4 Tables; and Vol.II. Appendix J. Attachment J2. Page J2-2,3 & 4. Soil and Sediment Dermal Contact, Groundwater Ingestion, and Intake of Radionuclides from Ingestion and Inhalation equations.

CDPHE checked the available documentation, and the FC = Fraction contacted that is contaminated, was never approved by either Agency. In a letter to Steve Slaten dated April 11, 1995 EPA, with the concurrence of CDPHE, directed DOE to delete the "fraction contacted from the contaminated source" parameter for all open space receptors. The only acceptable FC for RME estimates = 1. It was my understanding from the Template discussions which occurred late winter 1994 and spring 1995 that both Agency positions were that FC = 1 for RME estimates applied to <u>all</u> receptors. Though it appears that DOE has followed this agreement for the RME receptors, CDPHE does not believe the final discussions ever took place over the CT values for this fraction contacted.

The RME value for FC (for dermal exposure) listed in the latest (June 15, 1995) version of the Template is RME = 1, and CT = 0.64 for the residential receptor and 0.9 for occupational receptors. A CT value for the open space receptor was never discussed to my knowledge. Because this open space receptor appears to be the only one actually evaluated for dermal exposure by DOE, DOE needs to justify its value of 0.5 for PCBs and bis(2-ethylhexyl)phthalate in pond sediment, in particular. This is especially true since this number differs even from the unapproved fractions listed in the June 15 Template.

The Agencies' rationale for disapproving of this fraction contacted is as follows: Except for the ingestion of homegrown produce under a residential scenario, neither the EPA nor the CDPHE toxicologists feel that the fraction contacted factor is acceptable. These factors are described as time-weighted factors in the Template footnotes. Both CDPHE and EPA believe these factors double-count the time component since the exposure frequency has already been reduced to account for the average time spent at the location. In addition, the exposure point concentration term represents the integrated contaminant concentrations which a receptor contacts on average over a period of time, and already takes activity patterns into account.

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42) Vol.I. Appendix J. Section J6.2.3 Soil and Sediment Dermal Contact. Page J6-8. Absorption Factors.

DOE assumed 6% absorption through skin for PCBs and 1% absorption for other types of organics. These values are acceptable.

43) Vol.I. Appendix J. Table J6-1 Age-Weighted Soil and Sediment Ingestion Rates for Carcinogens and Radionuclides

It is unclear how DOE came up with either the CT age-adjusted ingestion rate for radionuclides for the open space receptor. CDPHE obtained a different number. The CT IRadj for open space receptor exposure to rads CDPHE got was 275 mgy/d.

44) Vol.I. Appendix J Table J6-4 Dermal Absorption Fractions and Dermal Permeability Constants for COCs in Soil and Surface Water.

Since this is a public document, it may be helpful to include a footnote to this table explaining which dermal absorption fractions will be used for soil absorption of which groups of chemicals, and that dermal permeability constants are only appropriate to use to calculate dermal absorption from water, and will not be used for soil absorption calculations.

45) Vol.I. Appendix J. Section J7.1 Toxicity Factors Introduction. Page J7-2.

What is the EPA, 1992f reference? It is not listed in the reference section of this volume.

46) Vol.I. Appendix J. Section J7.1 Toxicity Factors, Introduction. Page J7-3.

Here is a paragraph-long discussion of why DOE decided not to evaluate dermal exposure to PAHs. This discussion is fine. However, the underestimation of risks from dermal exposure to this class of chemicals must be assessed qualitatively in the uncertainty section There is a complete exposure pathway for several receptors

47) Vol.I. Appendix J Table J7-1 Toxicity Factors for Chemicals of Concern, Organic Compounds and Metals.

ECAO has derived a provisional inhalation RfC for tetrachloroethene of 0.4 mg/m^3. This number should be included in this table, and used in DOE's risk assessment calculations.

48) Vol.I. Appendix J. Section J10.0 Uncertainties and Limitations.

Limitations of DOE's Uncertainty Assessment.

- DOE did not qualitatively assess dermal exposure to PAHs.

- DOE did not qualitatively assess potential inhalation toxicity of metals and semivolatile organics that had oral toxicity factors, but not inhalation toxicity factors. Because these latter two classes of chemicals did not have inhalation toxicity factors, DOE has really only assessed the inhalation risks due to radionuclides, and ignored the risks from the other chemical classes.

- DOE did not discuss the potential synergistic, antagonistic, or additive effects due to exposure to multiple contaminants, though it did add the carcinogenic risks and noncarcinogenic hazards. A brief discussion also should be included in the uncertainty section.

49) Vol.II. Appendix J. Attachment J1.

It would have made review of this document much easier if somewhere in this document DOE had listed the COCs present at each AOC in each media. Some AOCs do not contain every COC in surface soil, for example.

50) Vol.II. Appendix J Attachment J1.

Where is the table showing the pond surface water values for AOC No. 3?

51) Vol.II. Appendix J. Attachment J1.

Where is the data showing di-n-butyl phthalate in AOC 4 pond surface water?

52) Vol.II. Appendix J. Attachment J2. Page J2-1. Soil and Sediment Ingestion equation.

See comments No. 39 and 41.

53) Vol.II. Appendix J. Attachment J2. Table AT2-1.

Neither CDPHE nor EPA toxicologists have agreed to the Central Tendency soil and dust ingestion rates of 10 mg/day for industrial workers and 5 mg/day for office workers. The literature evidence does not support these low numbers, and neither does current EPA draft guidance, "Superfund's Standard Default Exposure Factors for the Central Tendency and Reasonable Maximum Exposure" (USEPA, 1993). In the EPA draft guidance, the central tendency value for adult workers is listed as 50 mg/day for both non-contact intensive

industrial and office workers, and 100 mg/day for non-contact intensive RME industrial and office workers.

54) Vol.II. Appendix J. Attachment J2. Table AT2-8 footnotes.

How can 0.8 = $1-S_e$ be substantial and limited at the same time (footnotes 5 & 8)?

55) Vol.II. Appendix J. Attachment J3. Future Ecological Worker AOC No. 3 inhalation of particulates from stream/dry sediment table.

Where does the 2 m^3/d Inhalation Rate come from? The Template lists an RME value of 1.4 m^3/hr or a CT of 0.83 m^3/hr. As a result of this incorrect factor, DOE did not calculate risks from inhalation correctly in these tables. The correct risks for Am inhalation = 8.68 E-13 and for Pu inhalation = 5.08 E-12.

56) Vol.II. Appendix J. Attachment J3. Future Ecological Worker AOC No. 3 & 4 External irradiation from stream/dry sediment CT tables.

Where does the 0.019 EF come from? 65/365 days = 0.2, as listed in the Template. Consequently, listed risks are incorrect.

57) Vol.II. Appendix J. Attachment J3. Arsenic in Stream/Dry Sediment Open Space Recreational Use, AOC No.3 & 4 tables.

The CT Ingestion rate values used in this table's calculations are the old DOE proposed numbers which were rejected by both the State and the EPA. These values are far too low, and should be replaced with the agreed upon values of 25 mg/day and 50 mg/day for adult and children soil/sediment ingestion respectively, and the risks recalculated. The correct values were used in other tables for this pathway.

58) Vol.II. Appendix J. Attachment J5. Future Open Space Recreational Use Receptor, A Series Ponds, Pond Sediment Ingestion Table.

The values DOE lists for RME intake and carcinogenic risks from ingestion of sediment containing 0.105 mg/kg Aroclor-1254 are incorrect. The correct values are, intake =5.87 E-9 mg/kgd, and risk = 4.52 E-8. DOE calculated its risk values using the unapproved matrix factor.

59) Vol.II. Appendix J. Attachment J5. Future Ecological Researcher Receptor, A Series Ponds, Pond Sediment Ingestion Table.

Since the matrix effect was never approved, the correct RME intake

factor should be 8.39 E-10 and the correct carcinogenic risk from pond sediment ingestion for Aroclor-1254 should be 6.78 E-10.

60) Vol.II. Appendix J. Attachment J5. Future Ecological Researcher Receptor, A Series Ponds, Dermal Contact with Pond Sediment Table.

The wrong exposure point concentration for Aroclor-1254 in pond sediment is listed on the RME table. Instead of 2.047 mg/kg it should be 0.105 mg/kg.

61) Vol.II. Appendix J. Attachment J5. Page J5-3.

Text on this page refers to Table J3-20. Where is this table? The tables in Attachment J3 are not labeled, and the concentration-toxicity screen for pond sediments does not show any uranium data. Where is the uranium data?